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CONSERVATION ISSUES
ACTIVITIES TOWARDS PRIMATE CONSERVATION IN PANAMA

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Keywords	Abstract
Primate Conservation; Panama.	Neotropical Primates are threatened due to deforestation and hunting pressure. Nowadays there are many subspecies of primates living in reduced areas. These subspecies are poorly studied due to factors such as remote locations, political situations or the expensive logistics required. Although population surveys are important to obtain baseline information for the conservation of critically endangered primates, there are some opportunities where population censuses could be used in conjunction with rapid conservation strategies. In this report we encourage scientists to use collateral techniques that could positively impact the local community while other studies are underway. Some of those activities are the involvement of biology students from the target country, the use of informative material to spread the scientific information acquired, and raising the awareness of community leaders so that a long term conservation program can be established in the future.

Introduction

Panama is home of 13 subspecies of non-human primates, two mantled howler monkeys *Alouatta palliata palliata* and *A. p. aequatorialis* [16,18], the Coiba and Azuero howler monkey *A. coibensis coibensis* and *A. c. trabeata* [12, 13, 14, 15], four spider monkeys, the *Ateles geoffroyi panamensis*, *A. g. azuerensis*, *A. g. grisescens* and *A. fusciceps rufiventris*, these considered the most endangered primates in Panama [11, 13]. Followed by two capuchin monkeys *Cebus imitator* and *C. capucinus*, both have been identified as Regionally Endangered by FCPP, due to the fact that these species are directly hunted by poachers in order to minimize the damage they cause in crops [13, 15]. Panama also has the Central American Squirrel monkey *Saimiri oerstedii oerstedii*, Regionally Endemic for Chiriqui province in Panama [16], the tamarin *Saguinus geoffroyi* and the only nocturnal monkey found in Mesoamerica, the *Aotus zonalis*, turning Panama in the most diverse country of Mesoamerica in terms of primates [12, 13, 18, 20]. However, primate conservation actions have been recently initiated with the FCPP in 2001 [9, 21]. Most of the subspecies are considered Vulnerable, Endangered, and Critically Endangered, due to anthropogenic pressures

including: exposure to crop spraying, pet trade, land exploitation for agricultural activities, cattle ranching, hunting, mining, wrong tourism activities, expansion of teak plantations, and most recently real estate investments [12, 14]. Due to these reasons, FCPP has developed an educational program to conserve the Panamanian primates while doing long term monitoring surveys around the country. Our objectives have been to create good attitudes and practices from the human community to mitigate decreasing of the primate's population living in the fragments forest and living fences out to the protected areas.

We consider being in touch with the communities improve our communication with the local people and impact in a positive way to the wildlife population living near to these habitats in Panama. We summarized here some activities that have been important to develop interest in people to study, protect and conserve the non-human primates in Panama. These activities have been generating data through before-after questionnaires' for each town visited (e.g. Chiriqui province, Azuero Peninsula, Chucanti Reserve, between others) [10, 11, 12, 13, 15, 16]. We would like to encourage native biologist or primatologist from Latin-American countries to promote similar plans in order to protect their endangered species and obtain accurate data from their countries. These initiatives in Panama have been implemented in the following ways:

Training of students from the Biology School of the University of Panama

This training is free and includes teaching different techniques for surveying primates, specifically for *Alouatta*, *Ateles* and *Cebus* genus. The training includes how to collect field data on primate group structure, mapping, compass use, and calculating distances and height for habitat description. After five hours of theory, the project offers the students the opportunity to practice these methods in the field acting as volunteers in five to ten day surveys. Field training includes the use of GPS, recorder equipment to obtain vocalization data, fecal sampling and other related activities. The goal of this initiative is to develop the interest of senior biology students in primate research. At the same time, the students will be supporting our project with their fieldwork.

Educational activities at the primary and secondary schools

Educational talks have been developed to offer basic information to children in the regional schools. Over all deforested areas where remaining primate's populations live close to the villages and are at a higher risk [19, 21]. In these presentations, we talk about primate biodiversity, the primates, and the characteristics that humans share with them as part of the same taxonomic Order [3,16]. The talks also touch on basic information about primate food, their importance in the ecosystem as seed dispersers, pollinators, and how they contribute to the survival of other wild animals (e.g., deer, pacas, agouties, peccaries, and others). We normally conclude with ten minutes of questions or drawing activities, where we measure the knowledge of the students after each talk and answer any remaining questions that they might have [21]. We give each school posters with information of the subspecies primates and how they can help to minimize their risk of extinction. The initiative also gives away

bookmarks, t-shirts and stickers, with the image of the most endangered non-human primates in the region and a message on the back of how the locals can help the primates which are a part of their heritage and responsibility [5, 6, 7].

Educational activities around natural reserves and villages

For those protected areas, we have contacted members of the Environmental Authority of Panama (ANAM) and their forest rangers every year before and during our field work [1, 11, 12]. Our visits with the forest rangers include an open discussion where we exchange information about our results, what we do in Panama for primates and, their experiences sighting monkeys and conservation issues in the area. We give them new information and t-shirts with conservation messages or any other informative material. Our goal is focused on obtaining information on the ranger's needs and how they think they can improve protection of the natural areas [17, 19]. That information is used to evaluate the effectiveness of the parks and reserves according to the Action Plan for Mesoamerican Primates document [20], and make recommendations to the ANAM's directors for future management of the parks and reserves of the zone.

We are interested in knowing locals point of view about having primates near to their houses, as well as the past history of the occurrence of the primates and local extinctions of already isolated populations. Our goal is to involve local people and have them participate in our activities, obtaining information about the history of their fauna, native plant knowledge, and the presence and problems related to the non-human primates [7, 19, 21].

Road signs, youtube videos, and newspaper publications

The information obtained is passed to the general public beyond the scientific community by putting signs along the roads, posting videos with conservation messages on the internet and publishing articles in national newspapers. Panamanian primates can be found in gallery forests along some secondary roads and near to bridges, we have posted some Spanish-English signs on the appropriate sides, to warn people not to feed the monkeys and to drive in high speed. Feeding monkeys was practiced in the past, in some areas where people feel sympathy for them [12, 21], however, it caused mortality as monkeys road-killed and being poisoned by locals, arguing that the monkeys (any species) could damage their crops, or plantations, and to protect their cattle from the larvae of the botfly *Cuterebra baeri* that they see on the howler monkeys [12]. The consistency of our visits every year and volunteers visiting the communities are now helping to protect the monkeys in those vulnerable areas, changing the perception of them in a positive way [21].

Secondary school students, who have easy access to internet, are now less familiar with their native monkeys living in their own town. FCPP has posted videos on *youtube.com*, with environmental education subjects [12, 21]. The idea is to keep the cyber students and the general public informed about the fauna and flora in our region as an optional way to inform Panamanians about our activities. Publications of general information related to this project are also part of our goals, so we are publishing articles related to conservation in national newspapers [21]. This information is accessible to the local community where we work and encourage the conservation of the fauna and flora in the country.

Outcomes

We have further evidence of positive effects of the program we are conducting on the local people, based on our recent questionnaires, the people are showing an increase of 30% in basic knowledge related to the monkeys, and owners of agricultural lands are avoiding the unnecessary cutting of trees, as happened before [2, 5, 6, 10, 22]. The primate's knowledge of the land owners had a further improvement of 71% in 2011 compared with the first pre-survey (42% for 2001) [10, 12, 21]. Students trained by our program have assisted visiting primatologist researchers in Panama, conducting their own research, and some others have been part of our environmental education team, giving talks in secondary schools around Panama, this technique has led to an increase of the number of Panamanian biologists interested in studying native primates. FCPP address more than 300 local students per year in the entire country, and forest rangers are directly in communication with FCPP to protect National Parks and Reserves [12, 21]. Since 2001 to the present we have published more than ten newspaper articles related to the critical situation of the monkeys in the area, jaguar conservation issues, and two more demanding the ANAM to stop logging activities in the Maje Mountain Chain in Darien province, where deforestation is being increasing yearly [13].

After being in the whole educational roll by our side, government and National Institutions in Panama, have been approached in support to our efforts. Recently, the Secretary of Science, Technology and Innovation of the Republic of Panama (SENACYT) in collaboration with FCPP helped us printing out educational guides for school teachers [21]. The document “Guía Didáctica por la Conservación de los Primates de Azuero” prepared by FCPP incorporated dynamics and topics related to the primates and to the yearly study plan for the Panamanian communities. Measurements of the effectiveness of these conservation activities include the continual monitoring and evaluation of primate populations and vegetation in old and new forest patches [10, 12]. At the moment, all the primate' groups that have been sighted since 2001 have survived and their habitats have been almost untouched [12, 13, 15, 21], this could be considered an important achievement of our project. Future projects include the measurement and comparison of forest expansion and regeneration; that will be done using advanced techniques of GIS. Around 12 YouTube videos have been released in the web to promote conscience to the Panamanian primates, so far with an average of visits of 1,100.

Recommendations for national scientists

The direct access to the community and interaction with the local people call our attention for other species that could be positively impacted by our work (e.g. bats, wildcats), helping in the end, with the complete system of flora and fauna [1, 2, 3, 4, 19]. The participation of the local biologists, local people and the support from national and international institutions is crucial to keep up our long term efforts of education and conservation, trying to stop hunting for monkeys [6, 7, 9, 12, 16, 21].

Based on the Action Plan for the Mesoamerican Primates [20], the Primate Specialist

Group has classified the two most important steps toward the primate's conservation. There are the Study Priorities (E) and the Conservation Actions (AC). Taking this document as a guide, the FCPP has achieved the identification and monitoring populations in protected areas, estimation of densities and population growth, the actual distribution, long-term evaluations for primate communities, and viability of populations [21]. We have accomplished the promotion of new primatologists to study and continue long-term projects, the advice to the governmental authorities in the primate's knowledge. Basically, what we have seen while working in the communities is that people reject the idea of conservation not because they do not care about the species but because they lack of information and they think they cannot use their own land to obtain their resources for subsistence, also found in [1, 3, 4, 6, 7, 8, 17, 21, 22] as implications of restricting the use of land without incentives for the locals [3, 21]. For areas already deforested but with certain amount of fauna, we recommend a permanent environmental education rather than creating more natural reserves because new natural reserves will not be functional without an educational plan [7, 21]. Our yearly monitoring of primates and our educational efforts in the area encourage the cooperation of the locals and help us to stay vigilant to any changes [7, 9, 21, 22]. Our idea moreover, is to encourage the use of living fences [10], which is already a cultural practice, and promote the connectivity of patches of forest with gallery forest and reserves already established [19, 20, 21].

Conclusions

The conservation activities for primates in Panama have been developed with the strong support of local volunteers and of national and international organizations not settled in Panama. Efforts for conservation do not have to start with a huge amount of money; they could start with real compromise and voluntary efforts from native scientists, to work for the conservation of their species and ecosystems. For visiting-conservationist scientists, the goal should be to train and/or support native scientists to develop conservation actions, which will be the best way to protect their resources in the future of that country (having in mind that their resources are still our resources as we all are affected by world deforestation). Panama has suffered a lack of local scientists interested in the study of primatology, even being the first place where Neotropical Primates were studied and primatology developed in Latinamerica [5, 9, 21]. Even with 100 years of permanent presence of scientists from other countries, established in Panama [5], its shows that conservation really need to be attached with locals, and visitor scientists should incorporate in their schedule a better plan to do a better impact with their host country while doing their research [3, 7, 21]. This will be positive for the visitors and also for the natural resources that normally is on need to generate scientific information to conserve the tropics and the humanity.

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